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BEFORE HIROSHIMA

It has been mentioned publicly on several occasions that even before the first atomic bomb was exploded over Japan, scientists attempted to convey to the government their views on the social and political implications of the release of atomic energy, particularly its use for military purposes.

The Army has now released for publication, with insignificant deletions, a report presented on June 11, 1945—two months before Hiroshima—to the Secretary of War, by a "Committee on Social and Political Implications," appointed by the Director of the Metallurgical Laboratory in Chicago. It consisted of three physicists, three chemists and one biologist, under the chairmanship of Professor James Franck.

The report of June 11 was not the first formulation of the views which prevailed among scientists on the effect of the atomic bomb on warfare, the possibilities of defense, the dangers of an atomic armaments race and the necessity for international control of atomic energy. In fact, these ideas—which since Hiroshima have become familiar by their repetition in practically all public statements on atomic energy emanating from scientific sources—became crystallized in the minds of many scientists on the Project as early as 1943 and 1944, and found expression in several individual and collective memoranda. What caused the report of June 11, 1945 to be somewhat different from its predecessors, was the fact that by then the war in Europe had ended, and the danger of the enemy countries developing the bomb first had disappeared, while at the same time, the question of the use of the bomb against the remaining enemy—Japan—had become acute because of our own progress. (The report was dispatched to Washington six days before the New Mexico test explosion!) This has caused the "Committee on Social and Political Implications" to supplement general considerations of future policy with a discussion of the practical problem—shall America use atomic bombs in the Japanese war, and, if so, how shall they best be used?

The main conclusion reached by the Committee was that the use of the bomb should be considered as a fateful political decision, and not merely as a matter of military tactics. Anticipating that within a few years after the beginning of a race of atomic armaments, other large nations will be able to make their own atomic bombs, and that in a world armed with such bombs, the security of the United States will be gone, and her large cities and industrial concentrations will be extremely vulnerable to devastating attack, the Committee argued that the primary political-military aim of America should be the prevention of atomic wars in future. From this point of view, the Committee felt that America should not first introduce the atomic bomb as a legitimate means of warfare, by using it for a surprise attack on Japan. Instead, the report proposed, as the first step, a demonstration of the bomb to the nations of the world, including Japan, in an uninhabited locality.

The report was agreed upon unanimously by the seven scientists on the Committee. It undoubtedly expressed the opinion of a considerable group of scientists at the Project. It cannot claim, however, to be the official expression of view of the scientists on the Project. There were undoubtedly among scientists those who felt that the way to obtain the maximum possible effect of the bomb in shortening the war and reducing American (and incidentally also Japanese) casualties, lay in an all-out attack by the new weapon on Japanese homeland. Organizations such as the Atomic Scientists of Chicago or the Association of Oak Ridge Scientists, which could speak authoritatively for a large majority of scientists on the Manhattan Project, were formed only three months later, and had no opportunity to express their opinion on the use of the atomic bombs at Hiroshima and Nagasaki; this was water over the dam, and there appeared to be no reason to risk disagreements on past events when the groups of scientists were all united on what the future developments should be.

Between the transmittal of the report to the Secretary of War on June 11, and the dropping of the first bomb on Japan on August 6, two developments took place. One was a petition to President Truman, signed by 64 scientists associated with the Metallurgical Project. The authors of this petition felt that the Committee report, sent through the official War Department channels, was not enough, and that an appeal sent directly to the President and carrying the signatures of individual scientists, would be more effective.

The other development was a poll of scientists to which Dr. A. H. Compton has recently referred in a public statement. This poll, taken on Dr. Compton's request by the Director of the Metallurgical Laboratory, presented five alternatives, ranging from the all-out use of the atomic bomb "as the Army may see fit," through "demonstration on a military objective," and "demonstration in an uninhabited locality," to "no use in Japanese war at all" and "keeping the existence of the bomb a secret." Over 150 scientists took part in the poll, with over one-half voting for "preliminary demonstration on a military objective," about one- third for "preliminary demonstration on uninhabited locality," and small groups for all-out use, or no use under any conditions.

Opinions will necessarily be divided as to whether the destruction of Hiroshima and Nagasaki with over 200,000 casualties was a "demonstration on a military objective, (as was implied in Dr. Compton's speech) or an "all-out use at the discretion of the Army."

There is no doubt that the two bombs dropped on Hiroshima and Nagasaki brought the war to an immediate conclusion and thus saved many casualties; it is also a matter of fact that no great opposition to the use of the bomb has developed after the fact either in this country or abroad, apart from some statements mainly by religious groups (including such authoritative ones as the Vatican and the Federal Council of Churches in America).

Whether the capitulation of Japan could have been brought about by a mere demonstration of atomic weapons, nobody will ever be able to tell with certainty. Whether the difficult task of achieving international arrangements capable of preventing future atomic wars has been made still more difficult by the decision to use the bombs in Japan, will also remain a matter of speculation. We reprint the June 1945 report not to invite recriminations or criticism of the decisions of our government, but because we believe it to be a document of historical interest.

A Report to the Secretary of War . . . . . June 1945

I. Preamble

The only reason to treat nuclear power differently from all the other developments in the field of physics is the possibility of its use as a means of political pressure in peace and sudden destruction in war. All present plans for the organization of research, scientific and industrial development, and publication in the field of nucleonics are conditioned by the political and military climate in which one expects those plans to be carried out. Therefore, in making suggestions for the postwar organization of nucleonics, a discussion of political problems cannot be avoided. The scientists on this Project do not presume to speak authoritatively on problems of national and international policy. However, we found ourselves, by the force of events, during the last five years, in the position of a small group of citizens cognizant of a grave danger for the safety of this country as well as for the future of all the other nations, of which the rest of mankind is unaware. We therefore feel it our duty to urge that the political problems, arising from the mastering of nuclear power, be recognized in all their gravity, and that appropriate steps be taken for their study and the preparation of necessary decisions. We hope that the creation of the Committee by the Secretary of War to deal with all aspects of nucleonics, indicates that these implications have been recognized by the government. We believe that our acquaintance with the scientific elements of the situation and prolonged preoccupation with its world-wide political implications, imposes on us the obligation to offer to the Committee some suggestions as to the possible solution of these grave problems.

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Scientists have often before been accused of providing new weapons for the mutual destruction of nations, instead of improving their well-being. It is undoubtedly true that the discovery of flying, for example, has so far brought much more misery than enjoyment and profit to humanity. However, in the past, scientists could disclaim direct responsibility for the use to which mankind had put their disinterested discoveries. We feel compelled to take a more active stand now because the success which we have achieved in the development of nuclear power is fraught with infinitely greater dangers than were all the inventions of the past. All of us, familiar with the present state of nucleonics, live with the vision before our eyes of sudden destruction visited on our own country, of a Pearl Harbor disaster repeated in thousand-fold magnification in every one of our major cities.

In the past, science has often been able to provide also new methods of protection against new weapons of aggression it made possible, but it cannot promise such efficient protection against the destructive use of nuclear power. This protection can come only from the political organization of the world. Among all the arguments calling for an efficient international organization for peace, the existence of nuclear weapons is the most compelling one. In the absence of an international authority which would make all resort to force in international conflicts impossible, nations could still be diverted from a path which must lead to total mutual destruction, by a specific international agreement barring a nuclear armaments race.

II. Prospects of Armaments Race

It could be suggested that the danger of destruction by nuclear weapons can be avoided—at least as far as this country is concerned—either by keeping our discoveries secret for an indefinite time, or else by developing our nuclear armaments at such a pace that no other nations would think of attacking us from fear of overwhelming retaliation.

The answer to the first suggestion is that although we undoubtedly are at present ahead of the rest of the world in this field, the fundamental facts of nuclear power are a subject of common knowledge. British scientists know as much as we do about the basic wartime progress of nucleonics—if not of the specific processes used in our engineering developments—and the role which French nuclear physicists have played in the pre-war development of this field, plus their occasional contact with our Projects, will enable them to catch up rapidly, at least as far as basic scientific discoveries are concerned. German scientists, in whose discoveries the whole development of this field originated, apparently did not develop it during the war to the same extent to which this has been done in America; but to the last day of the European war, we were living in constant apprehension as to their possible achievements. The certainty that German scientists were working on this weapon and that their government would certainly have no scruples against using it when available, was the main motivation of the initiative which American scientists took in urging the development of nuclear power for military purposes on a large scale in this country. In Russia, too, the basic facts and implications of nuclear power were well understood in 1940, and the experience of Russian scientists in nuclear research is entirely sufficient to enable them to retrace our steps within a few years, even if we should make every attempt to conceal them. Even if we can retain our leadership in basic knowledge of nucleonics for a certain time by maintaining secrecy as to all results achieved on this and associated Projects, it would be foolish to hope that this can protect us for more than a few years.

It may be asked whether we cannot prevent the development of military nucleonics in other countries by a monopoly on the raw materials of nuclear power. The answer is that even though the largest now known deposits of uranium ores are under the control of powers which belong to the "western" group (Canada, Belgium and British India), the old deposits in Czechoslovakia are outside this sphere. Russia is known to be mining radium on its own territory; and even if we do not know the size of the deposits discovered so far in the USSR, the probability that no large reserves of uranium will be found in a country which covers one-fifth of the land area of the earth (and whose sphere of influence takes in additional territory), is too small to serve as a basis for security. **Thus, we cannot hope to avoid a nuclear armament race either by keeping secret from the competing nations the basic scientific facts of nuclear power or by cornering the raw materials required for such a race.**

We now consider the second of the two suggestions made at the beginning of this section, and ask whether we could not feel ourselves safe in a race of nuclear armaments by virtue of our greater industrial potential, including greater diffusion of scientific and technical knowledge, greater volume and efficiency of our skilled labor corps, and greater experience of our management—all the factors whose importance has been so strikingly demonstrated in the conversion of this country into an arsenal of the Allied Nations in the present war. The answer is that all that these advantages can give us is the accumulation of a larger number of bigger and better atomic bombs.

However, such a quantitative advantage in reserves of bottled destructive power will not make us safe from sudden attack. Just because a potential enemy will be afraid of being "outnumbered and outgunned", the temptation for him may be overwhelming to attempt a sudden unprovoked blow—particularly if he should suspect us of harboring aggressive intentions against his security or his sphere of influence. In no other type of warfare does the advantage lie so heavily with the aggressor. He can place his "infernal machines" in advance in all our major cities and explode them simultaneously, thus destroying a major part of our industry and a large part of our population, aggregated in densely populated metropolitan districts. Our possibilities of retaliation—even if retaliation should be considered

adequate compensation for the loss of millions of lives and destruction of our largest cities—will be greatly handicapped because we must rely on aerial transportation of the bombs, and also because we may have to deal with an enemy whose industry and population are dispersed over a large territory.

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In fact, if the race for nuclear armaments is allowed to develop, the only apparent way in which our country can be protected from the paralyzing effects of a sudden attack is by dispersal of those industries which are essential for our war effort and dispersal of the populations of our major metropolitan cities. As long as nuclear bombs remain scarce (i.e. as long as uranium remains the only basic material for their fabrication), efficient dispersal of our industry and the scattering of our metropolitan population will considerably decrease the temptation to attack us by nuclear weapons.

At present, it may be that atomic bombs can be detonated with an effect equal to that of 20,000 tons of TNT. One of these bombs could then destroy something like 3 square miles of an urban area. Atomic bombs containing a larger quantity of active material but still weighing less than one ton may be expected to be available within ten years which could destroy over ten square miles of a city. A nation able to assign 10 tons of atomic explosives for a sneak attack on this country, can then hope to achieve the destruction of all industry and most of the population in an area from 500 square miles upwards. If no choice of targets, with a total area of five hundred square miles of American territory, contains a large enough fraction of the nation's industry and population to make their destruction a crippling blow to the nation's war potential and its ability to defend itself, then the attack will not pay, and may not be undertaken. At present, one could easily select in this country a hundred areas of five square miles each whose simultaneous destruction would be a staggering blow to the nation. Since the area of the United States is about three million square miles, it should be possible to scatter its industrial and human resources in such a way as to leave no 500 square miles important enough to serve as a target for nuclear attack.

We are fully aware of the staggering difficulties involved in such a radical change in the social and economic structure of our nation. We felt, however, that the dilemma had to be stated, to show what kind of alternative methods of protection will have to be considered if no successful international agreement is reached. It must be pointed out that in this field we are in a less favorable position than nations which are either now more diffusely populated and whose industries are more scattered, or whose governments have unlimited power over the movement of population and the location of industrial plants.

If no efficient international agreement is achieved, the race for nuclear armaments will be on in earnest not later than the morning after our first demonstration of the existence of nuclear weapons. After this, it might take other nations three or four years to overcome our present head start, and eight or ten years to draw even with us if we continue to do intensive work in this field. This might be all the time we would have to bring about the relocation of our population and industry. Obviously, no time should be lost in inaugurating a study of this problem by experts.

III. Prospects of Agreement

The consequences of nuclear warfare, and the type of measures which would have to be taken to protect a country from total destruction by nuclear bombing, must be as abhorrent to other nations as to the United States. England, France, and the smaller nations of the European continent, with their congeries of people and industries, would be in a particularly desperate situation in the face of such a threat. Russia and China are the only great nations at present which could survive a nuclear attack. However, even though these countries may value human life less than the peoples of Western Europe and America, and even though Russia, in particular, has an immense space over which its vital industries could be dispersed and a government which can order this dispersion the day it is convinced that such a measure is necessary—there is no doubt that Russia, too, will shudder at the possibility of a sudden disintegration of Moscow and Leningrad, almost miraculously preserved in the present war, and of its new industrial cities in the Urals and Siberia. Therefore, only lack of mutual trust, and not lack of desire for agreement, can stand in the path of an efficient agreement for the prevention of nuclear warfare. The achievement of such an agreement will thus essentially depend on the integrity of intentions and readiness to sacrifice the necessary fraction of one's own sovereignty, by all the parties to the agreement.

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One possible way to introduce nuclear weapons to one world—which may particularly appeal to those who consider nuclear bombs primarily as a secret weapon developed to help win the present war—is to use them without warning on appropriately selected objects in Japan.

Although important tactical results undoubtedly can be achieved by a sudden introduction of nuclear weapons, we nevertheless think that the question of the use of the very first available atomic bombs in the Japanese war should be weighed very carefully, not only by military authorities, but by the highest political leadership of this country.

Russia, and even allied countries which bear less mistrust of our ways and intentions, as well as neutral countries may be deeply shocked by this step. It may be very difficult to persuade the world that a nation which was capable of secretly preparing and suddenly releasing a new weapon, as indiscriminate as the rocket bomb and a thousand times more destructive, is to be trusted in its proclaimed desire of having such weapons abolished by international agreement. We have large accumulations of poison gas, but do not use them, and recent polls have shown that public opinion in this country would disapprove of such a use even if it would accelerate the winning of the Far Eastern war. It is true that some irrational element in mass psychology makes gas poisoning more revolting than blasting by explosives, even though gas warfare is in no way more "inhuman" than the war of bombs and bullets. Nevertheless, it is not at all certain that American public opinion, if it could be enlightened as to the effect of atomic explosives, would approve of our own country being the first to introduce such an indiscriminate method of wholesale destruction of civilian life.

Thus, from the "optimistic" point of view—looking forward to an international agreement on the prevention of nuclear warfare—the military advantages and the saving of American lives achieved by the sudden use of atomic bombs against Japan may be outweighed by the ensuing loss of confidence and by a wave of horror and repulsion sweeping over the rest of the world and perhaps even dividing public opinion at home.

From this point of view, a demonstration of the new weapon might best be made, before the eyes of representatives of all the United Nations, on the desert or a barren island. The best possible atmosphere for the achievement of an international agreement could be achieved if America could say to the world, "You see what sort of a weapon we had but did not use. We are ready to renounce its use in the future if other nations join us in this renunciation and agree to the establishment of an efficient international control."

After such a demonstration the weapon might perhaps be used against Japan if the sanction of the United Nations (and of public opinion at home) were obtained, perhaps after a preliminary ultimatum to Japan to surrender or at least to evacuate certain regions as an alternative to their total destruction. This may sound fantastic, but in nuclear weapons we have something entirely new in order of magnitude of destructive power, and if we want

to capitalize fully on the advantage their possession gives us, we must use new and imaginative methods.

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It must be stressed that if one takes the pessimistic point of view and discounts the possibility of an effective international control over nuclear weapons at the present time, then the advisability of an early use of nuclear bombs against Japan becomes even more doubtful—quite independently of any humanitarian considerations. If an international agreement is not concluded immediately after the first demonstration, this will mean a flying start toward an unlimited armaments race. If this race is inevitable, we have every reason to delay its beginning as long as possible in order to increase our head start still further.

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The benefit to the nation, and the saving of American lives in the future, achieved by renouncing an early demonstration of nuclear bombs and letting the other nations come into the race only reluctantly, on the basis of guesswork and without definite knowledge that the "thing does work," may far outweigh the advantages to be gained by the immediate use of the first and comparatively inefficient bombs in the war against Japan. On the other hand, it may be argued that without an early demonstration it may prove difficult to obtain adequate support for further intensive development of nucleonics in this country and that thus the time gained by the postponement of an open armaments race will not be properly used. Furthermore one may suggest that other nations are now, or will soon be, not entirely unaware of our present achievements, and that consequently the postponement of a demonstration may serve no useful purpose as far as the avoidance of an armaments race is concerned, and may only create additional mistrust, thus worsening rather than improving the chances of an ultimate accord on the international control of nuclear explosives.

Thus, if the prospects of an agreement will be considered poor in the immediate future, the pros and cons of an early revelation of our possession of nuclear weapons to the world—not only by their actual use against Japan, but also by a prearranged demonstration—must be carefully weighed by the supreme political and military leadership of the country, and the decision should not be left to the considerations of military tactics alone.

One may point out that scientists themselves have initiated the development of this "secret weapon" and it is therefore strange that they should be reluctant to try it out on the enemy as soon as it is available. The answer to this question was given above—the compelling reason for creating this weapon with such speed was our fear that Germany had the technical skill necessary to develop such a weapon, and that the German government had no moral restraints regarding its use.

Another argument which could be quoted in favor of using atomic bombs as soon as they are available is that so much taxpayers' money has been invested in these Projects that the Congress and the American public will demand a return for their money. The attitude of American public opinion, mentioned earlier, in the matter of the use of poison gas against Japan, shows that one can expect the American public to understand that it is sometimes desirable to keep a weapon in readiness for use only in extreme emergency; and as soon as the potentialities of nuclear weapons are revealed to the American people, one can be sure that they will support all attempts to make the use of such weapons impossible.

Once this is achieved, the large installations and the accumulation of explosive material at present earmarked for potential military use will become available for important peace-time developments, including power production, large engineering undertakings, and mass production of radioactive materials. In this way, the money spent on wartime development of nucleonics may become a boon for the peacetime development of national economy.

IV. Methods of International Control

We now consider the question of how an effective international control of nuclear armaments can be achieved. This is a difficult problem, but we think it soluble. It requires study by statesmen and international lawyers, and we can offer only some preliminary suggestions for such a study.

Given mutual trust and willingness on all sides to give up a certain part of their sovereign rights, by admitting international control of certain phases of national economy, the control could be exercised (alternatively or simultaneously) on two different levels.

The first and perhaps simplest way is to ration the raw materials—primarily, the uranium ores. Production of nuclear explosives begins with the processing of large quantities of uranium in large isotope separation plants or huge production piles. The amounts of ore taken out of the ground at different locations could be controlled by resident agents of the international Control Board, and each nation could be allotted only an amount which would make large scale separation of fissionable isotopes impossible.

Such a limitation would have the drawback of making impossible also the development of nuclear power for peace-time purposes. However, it need not prevent the production of radioactive elements on a scale sufficient to revolutionize the industrial, scientific and technical use of these materials, and would thus not eliminate the main benefits which nucleonics promises to bring to mankind.

An agreement on a higher level, involving more mutual trust and understanding, would be to allow unlimited production, but keep exact bookkeeping on the fate of each pound of uranium mined. If in this way, check is kept on the conversion of uranium and thorium ore into pure fissionable materials, the question arises as to how to prevent accumulation of large quantities of such materials in the hands of one or several nations. Accumulations of this kind could be rapidly converted into atomic bombs if a nation should break away from international control. It has been suggested that a compulsory denaturation of pure fissionable isotopes may be agreed upon—by diluting them, after production, with suitable isotopes to make them useless for military purposes, while retaining their usefulness for power engines.

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One thing is clear: any international agreement on prevention of nuclear armaments must be backed by actual and efficient controls. No paper agreement can be sufficient since neither this or any other nation can stake its whole existence on trust in other nations' signatures. Every attempt to impede the international control agencies would have to be considered equivalent to denunciation of the agreement.

It hardly needs stressing that we as scientists believe that any systems of control envisaged should leave as much freedom for the peacetime development of nucleonics as is consistent with the safety of the world.

Summary

The development of nuclear power not only constitutes an important addition to the technological and military power of the United States, but also creates grave political and economic problems for the future of this country.

Nuclear bombs cannot possibly remain a "secret weapon" at the exclusive disposal of this country for more than a few years. The scientific facts on which their construction is based are well known to scientists of other countries. Unless an effective international control of nuclear explosives is instituted, a race for nuclear armaments is certain to ensue following the first revelation of our possession of nuclear weapons to the world. Within ten years other countries may have nuclear bombs, each of which, weighing less than a ton, could destroy an urban area of more than ten square miles. In the war to which such an armaments race is likely to lead, the United States, with its agglomeration

(Continued on last page)

France and Atomic Energy . . . . . *Frederic Joliot*

Scientific discoveries are the raw material of human progress. Since modern times, scientific research has been a common patrimony at the disposal of scholars and technicians. This common property created a solidarity throughout the world and kept going a spirit of international mutual help. Each seeker after knowledge, whatever his particularity may be, constantly benefits from discoveries made in every part of the world. If thirty people of the highest intelligence working together on one problem are suddenly split up, each one is reduced to a third, or rather I should say, to a 3/100 part of his efficiency.

For myself I realize that I have only been able to achieve certain results thanks, for instance, to Rutherford, Niels Bohr or Hahn, not to mention my French colleagues, to English, American, and Italian scientists etc. I acknowledge my debt of gratitude to them and am only too happy if my work has enabled certain English or American research workers to progress along a path which I was lucky enough to open to them.

FRANCE, A PIONEER IN NUCLEONICS

France can legitimately claim the knowledge of the secrets of Atomic Energy because she is the country which has given birth to and developed Nuclear Physics. Half a century has passed since Henri Bacquerel and the Curies set off on the road which has led to the present discoveries and their tradition, just as their researches have since then been carried on in our country without interruption. France was one of the first in the liberation of Nuclear Energy, and it was not until the events of 1940 that our work was interrupted after which it was carried on in England. French research workers, like Halban, Kowarski, Gueron, Goldschmidt, left France at that time to put their knowledge of this subject at the service of the Allies.

The French must be called upon to participate in the International Commission for the Control of Nuclear Energy, composed of scientific experts. This Commission, at each step of progress in the research, could indicate its possible dangerous applications, and make all arrangements to neutralize them. The control of production of Nuclear Energy is possible, because the production would require factories covering an enormous area which would naturally not pass unseen. If the number of machines used is known, it would be easy to calculate the amount of material they could turn out. Such knowledge would avoid monopoly of raw material, in itself a source of conflict. The scientists will obviously come to the conclusion that it is necessary to have international exchange and to suppress monopolies, whether it is a question of new radioactive products or new raw materials; plastics, textiles, etc. The story of petrol deposits confirms this outlook.

THE CONSEQUENCES OF SECRECY

I consider as very dangerous, as I have already said, the position taken up by the United States during recent talks, because keeping the secrets of the atomic bomb appears as a means of pressure. What is serious is that it should henceforth be admitted by certain people that it is possible to keep secret results obtained by scientific research in the field of Nuclear Science. It would thereafter be impossible to visit laboratories of our specialty, to keep going normal relationship with colleagues who are friends and with whom we have for so long collaborated over distances and frontiers.

It is true that for a long time we have been accustomed to industrialists keeping to themselves their technical secrets and methods of manufacture, but it is the first time that the free diffusion of the results of pure science has been forbidden. This principle of secrecy once accepted, there is no reason why it should not be extended to all fields of science. Chemistry, electricity, medicine, biology, even astronomy lead to discoveries which affect the condition of man and can be applied in a decisive manner to economics of war. If secrecy is extended to these sciences, the progress of civilization will be slowed down and may even be halted. We count on the Union of Scientists in every country to militate against the maintenance of secrets and to obtain a wide divulgation of the discoveries.

For he who says civilization says communication. If our species has become the human species, it is doubtless because we have a fairly large brain and hands, but above all because we have been able to create language which enables men to communicate with one another other than by gestures and grimace. The stagnation of civilization at certain periods seems to me due to the isolation of men in small groups. It is significant that in the Middle Ages, the best spreaders of civilization were the Troubadours, who made the different groups have contact with one another. The Renaissance is particularly the establishment of a vast circulation of thought among men. Is it desirable now to stop this circulation, this universal language, by decree? This would take us back to Merovingian times.

Continued secrecy would result in a race for scientific armaments. Each Nation would think that its rival was outdistancing it and would want to catch up. Nuclear Energy would no longer be the servant of civilization but only its destroyer. If the impossible happened and two great powers found themselves to be the sole possessors of the monopoly of this secret arm, other countries in self defense would hasten to discover and use more secret and terrible terrible arms, and above all more treacherous.

THE "SECRET WAR"

With the development of these secret arms, war could become so secret that man would know nothing of its start. Yesterday there was indeed no declaration of war, but the noise of the battle left no one in doubt that a conflict had broken out. But in the future, a country feeling secure through having in its possession a hundred atomic bombs would one day be warned by its statisticians: "for five years now" they will say, "the number of abortions in the central districts has grown to such proportions that there is not one normal birth in six; in the coastal ports fires are destroying the harvests, the drought in the North has deprived the country of a quarter of its electrical energy." Official Headquarters and parliamentarians will pore over these figures, make graphs and will find one explanation only of these multiple catastrophies; for several years war has been waged against their country with immense destruction and a considerable number of victims. And yet no one had known that hostilities had broken out. The enemy at that moment might already have obtained decisive victories and the country conquered without having fought. All that would be left to it would be to capitulate, to destroy the stock of atomic bombs on which it had blindly relied for its security and which will have proved as much an illusion as a line of concrete in 1940.

The day when the world realizes the possibilities of a secret war of this kind is the day when the people will start living in a perpetual state of siege. Facts prove that this ultra secret war is possible because it is already sporadically carried out by certain services who are defending monopolies. A country prospects for raw material essential to it. With any pretext at hand we then see the colony where the riches are found, claim its independence and revolt. If nevertheless the country succeeds in keeping the control of the riches which it has discovered, it is threatened with a famine of other raw material, the importation of which is indispensable.

As far as we are concerned, in spite of this regrettable secret, it is possible for French Scientists and technicians, and that will be the aim of the "Commissariat de l'Energie Atomique," to construct machines for the purpose of producing new radio-active elements and to liberate atom-

Atomic Bomb Damage - Japan and USA

. . . . R. E. Marshak, E. C. Nelson, L. I. Schiff

The photographs and descriptions of Hiroshima and Nagasaki after atomic bombardment are now familiar to everyone. But the full horror of the destruction has not yet been shown in pictures or described in words. It is hard to portray the effects that heat and gamma rays (which are nuclear X-rays) had on people. The fires that raged unchecked for days after the explosions were not photographed from the ground. The pictures of steel-frame buildings that still stand and appear to be only slightly harmed do not show the wrecked partitions and furniture or the remains of the people who were inside. Finally, it is hard to visualize the paralysis of nearly all fire-fighting and medical services. Many injured persons died in fires because there were no first-aid facilities left to help them.

To realize what an atomic bomb of the present type could do to an American city, one must first look at the ways in which it produces damage. Then the Japanese experience must be translated from Hiroshima and Nagasaki to a typical American city. Only in this way will it be possible to get some understanding of what an atomic bomb attack would mean to us if another war were ever to come.

FACTORS CONTRIBUTING TO DAMAGE

Four factors contribute to the destruction wrought by an atomic bomb. First, there is the blast, which is mainly responsible for wrecking buildings. Second, there is the enormous heat of the exploding bomb, which by itself can give people fatal burns and even set fire to flimsy structures. Third, there are the gamma rays given off at the instant of the explosion, which inflict a lingering death on people who are too close to the bomb. Finally, particularly if the bomb is exploded close to the ground, there may be radioactive materials left around as a by-product. These produce other gamma rays and may last for days or months afterward. In the two combat "drops" on Japanese cities, the bombs were exploded high in the air and the radioactive materials were dissipated by the wind.

It is worth looking at these four factors in more detail. As we do this, the careful studies that have been made of the damage produced in Hiroshima and Nagasaki will be used as a basis. The test shot in New Mexico also supplied a great deal of information on atomic bomb damage. However, the smaller height at which this bomb was detonated and the absence of buildings make these data less significant.

DESTRUCTION BY THE BLAST

The blast is the familiar concussion that results from ordinary explosions, but enormously magnified. At Hiroshima it wrecked ordinary wooden buildings out to a distance of one and a half miles, corresponding to an area of destruction of seven square miles. At Nagasaki the destruction distance was somewhat greater and would have corresponded to ten square miles if there had been that much city to be destroyed. Since the part of Nagasaki that was attacked was a long, narrow strip lying in a valley, the city area destroyed was somewhat smaller than at Hiroshima —about three square miles. The other seven square miles affected were outside the city limits. The largest demolition bomb previously used—the block-buster—contained two tons of TNT and had a destruction radius for ordinary wooden buildings of about five hundred feet (two city blocks). This gives a destroyed area of one thirty-fifth of a square mile—one three-hundred-and-fiftieth of that to be expected from a Nagasaki-type atomic bomb. This does not mean, however, that an atomic bomb is equivalent to only 350 block-busters. For the inaccuracies in bombing are so great that approximately three times this number of block-busters would have to be dropped in order to destroy ten contiguous square miles. Many of the bombs would overlap, and there would be significant undestroyed gaps. It follows, then, that one Nagasaki-type atomic bomb is equivalent to at least 1,000 block-busters in concentrated effect.

What is the blast from an atomic bomb like? First there is a strong shock wave that pushes very hard on any obstacle in its path for a very short time. This is followed at once by a great wind blowing out from the bomb—a super-hurricane that lasts about a second. The shock wave does most of its damage on large walls that face the bomb blast, collapsing ordinary buildings and stripping facings from steel-frame structures. The blast wind sweeps interior partitions and furniture out of the stronger buildings, snaps trees, bends metal poles, and carries away lighter objects such as street cars and small houses. General results in the two Japanese cities were as follows. The shock wave and the blast wind together demolished brick and timber buildings for nearly half a mile, and made them almost impossible to repair out to about a mile. Lighter frame buildings were demolished out to a mile and a half. Heavy steel-frame buildings appeared to be only slightly damaged from the outside if they were more than a quarter of a mile from the center of the bomb. But their insides were swept clean and in some cases the floors were collapsed, if they were within a mile and a half of the explosion. The flying debris inside these stronger structures killed or seriously injured all inhabitants. In Nagasaki, the Mitsubishi Steel Plant was nearly a mile from the bomb. Although most of the steel frame of the building remained standing, flying fragments of iron and machinery caused close to 100 per cent fatalities.

HEAT FROM THE BOMB

The enormous heat produced by an atomic bomb has no true counterpart in ordinary explosions. An ordinary bomb will not kill anyone by heat who would not have been killed by blast. Even if it were possible to set off 20,000 tons of TNT in one place, the heat would not be an important source of damage. Even at a distance of several miles, the heat given off by an atomic bomb is many times as intense as that from the sun on the hottest summer day. It will scorch wood a mile away and ignite flimsy materials at shorter distances. While some fires were started in this way in the two Japanese "drops," most of them were caused, as in ordinary bombing raids with high explosives, by the collapse of inflammable buildings around stoves and furnaces. The ultra-violet light accompanying the heat in an atomic bomb explosion is like that part of the sun's light which causes sunburn, only much more intense. The heat and ultra-violet light together have a greater effect on people than on buildings. In Japan, people within several hundred yards of the bomb were charred black, while those more than a mile away received a severe "sunburn." Many persons who were far enough away from the bomb to survive were later found to have a light unburned area—the "shadow" of a nose or an ear—across a heavily "sunburned" face.

A new feature of the atomic bomb in comparison with ordinary bombs is the fact that it gives off gamma rays, which affect people like a violent overdose of X-rays. The more delicate parts of the body, particularly the tissues that make the blood, are badly damaged. The blood loses its power to coagulate, and oozes into the flesh and even through the unbroken skin. The white blood corpuscles, whose job it is to fight infection, are killed and their replacement is inhibited. Because of this, in the two bombings of Japan practically all persons within half a mile of the center of explosion died later, even if they were shielded from the heat and not hurt by falling timbers and even

From Atomic Energy for the Layman, a forthcoming publication of the University of New Mexico Press. Printed by permission of the authors and publishers.

though they appeared immediately after the explosion to have been uninjured. Many of those farther from the explosion who received severe skin burns or were hit by flying debris did not recover as expected. The gamma rays had so lowered their resistance to infection that eventually they died, even from minor injuries.

The radioactive materials produced by the two combat bombs—such materials are not present in ordinary explosions—were dissipated by the wind. The bombs were deliberately exploded at a height great enough to make sure that this would happen. Consistent with the dissipation of the radioactive materials, the bomb is then set to go off at such a height that the largest possible area is covered by a blast strong enough to wreck ordinary buildings. Within limits, the higher the bomb is when it goes off, the greater the area covered by the blast, but the smaller the blast effect directly under the bomb. A combatant of the future might, however, choose to set the bomb off on or close to the ground. This would make the area destroyed by blast smaller, but would poison much of the region with radioactive substances. The wind would not clear them away, and they would settle on the ground. Gamma rays would then be present in dangerous amounts for weeks or months afterwards. This would hamper rescue work and make the region uninhabitable for some time.

In the two Japanese cities no deaths were due to radioactive substances remaining in the area after the explosion. The total number of deaths in Hiroshima from the other three factors, including fires caused by heat and blast, is estimated to have been between 100,000 and 150,000. In Nagasaki the deaths are believed to have numbered from 20,000 to 50,000.

What, then, could an atomic bomb of present type do to an American city? Most American cities would appear to suffer less than the Japanese cities did, because they are more strongly built. More buildings would remain standing, and fewer would be completely eradicated by fire. But the interior damage would be about the same, and there is little reason to believe that there would be fewer people killed. Furthermore, the open structure of Japanese buildings made them less vulnerable to blast than American buildings with their smaller window space would be. Let us now attempt to describe what would happen if an atomic bomb were ever to be dropped on a typical American city.

Everyone within half a mile of the explosion would be killed. Many of those out to one and a half miles would be killed by a combination of direct heat from the bomb, fire, injuries from falling buildings and flying debris, and gamma rays. Light frame buildings would be demolished for more than a mile around. Conventional brick houses would be wrecked for at least half a mile. Heavy steel-frame buildings, up to a quarter of a mile away, would have their facings stripped off. Most of them up to a mile and a half would be swept clean of windows and furniture, although they might appear only slightly damaged from the outside. The inhabitants would be killed or seriously injured by flying objects or by the collapse of floors. Openwork structures like bridges or trestles would stand the blast quite well. But for nearly a mile around, any trains or automobiles that happened to be on such structures would be blown off. Some underground systems such as subway tunnels, gas and water mains, and sewage drains would be collapsed directly beneath the bomb. Overhead electric and telephone lines would be broken.

The dead would number many tens of thousands. Casualties would result mainly from the collapse of light buildings and from flying fragments in heavier buildings together with burns and gamma-ray injuries to the blood. The enormous number of casualties would mean that among them large numbers of key personnel—doctors, fire-fighters, police, and civic leaders—would be rendered ineffective, thus hampering rescue work. This situation was especially striking at Hiroshima. The mass destruction of equipment and services as presently distributed in cities—fire trucks, hospitals, water mains, electric and telephone lines—would paralyze even a city only partly destroyed by the bomb. The care of the casualties would tax the facilities of neighboring large cities for hundreds of miles around.

All this from only one bomb. Although damage estimates based on the two Japanese cities may, as remarked before, exaggerate the effects on an American city, the use of larger numbers of bombs would more than cancel out the advantage than an American city has in being more strongly built. Atomic bombs can be made by the thousands, and no country is likely to launch an attack unless it has many bombs that can be devoted to each target city. Furthermore, it is certain that bombs can be made that will be much more powerful than those used against Japan. At least ten times the energy release might be achieved simply by assembling larger amounts of uranium 235 or plutonium. One or two such "improved" bombs would probably suffice to knock any city in the world out of action for weeks, even if the city were not completely destroyed. If there is ever to be a war involving the use of atomic bombs it would certainly be catastrophic.

France and Atomic Energy . . . . . Cont.

(Continued from page five)

ic energy for beneficial purposes. The atomic bomb represents but one of the applications of nuclear energy.

These machines supplying energy will enable important quantities of radio-active elements to be made, the application of which will be of the greatest use for industry and certain successes in biology and medicine. One can even foresee pacific applications of this bomb. It could doubtless be used to transform the surface of large portions of the earth, or to make clouds and to bring down rain over huge areas. We know even now that one day we shall be able to modify contour and climate; it may be that before too many years have gone by we shall be able to do this, at least we are glimpsing hitherto unthinkable possibilities. New radio elements are going to allow chemistry at a very high temperature.

It is certain that our capacity for industrial production does not equal that of other big nations in quantity, but our support cannot be overlooked. The same may happen with nuclear energy as has happened with aviation; we are not at the moment able to build flying fortresses in thousands, but we can make prototypes, undertake the building of planes equalling and sometimes surpassing the qualities of those of the big industrial nations.

We will work as much as is necessary to bring, within the scope of our country, our contribution to the industrial and scientific development which will enable man to progress and to know a better state. If the secrecy is maintained, that will not prevent us from pushing forward with our work and arriving at results which are certainly very honourable and very profitable. A nation can only justify its independence by exporting its achievements and by the blossoming of its thought. We are working to this end and France will bring to the world its share, the share by which it justifies its existence. We are optimists. We are certain that men will not allow progress to be shackled by a monopolization of thought.

An address delivered at the London Conference on Science and the Welfare of Mankind. The speeches of A. V. Hill and P. M. S. Blackett presented at this conference were printed in previous issues of the **Bulletin.**

Russia and the State Department Report . . . .

. . . . Maj. G. F. Eliot

The plan for the international control of atomic energy, prepared by the State Department's Board of Consultants as "a basis for discussion," will certainly be widely attacked as supporting the policy of "give away." Yet there is virtue in the board's observation that its proposals should be examined in the light of the alternative.

At first glance, there appears to be one insuperable objection to the plan. The use of such terms as "title," "possession," "ownership," "licensing," implies the existence of a body of known and accepted law under which these terms can have a meaning common to all parties to the agreement.

Such a body of law does not presently exist as between the Soviet Union and the United States or other western nations. International law itself, even in the western world, is vague and uncertain enough; but it might be possible to set up certain principles which could be commonly accepted both by those nations which draw their legal precedents from the English common law and those whose legal origins are in the Roman-Dutch tradition.

In our relations with the Russians, however, we have not even reached the point where we can write down a simple agreement on paper and have it mean the same thing to the Russians as it does to us. The trouble lies in interpretation. No human foresight can provide against every contingency.

There must be certain commonly accepted standards—that is, processes and precedents for interpretation. Every lawyer knows how much depends on these precedents, and how little on the written words of the statute.

For the United States to enter into any such agreement as is proposed by the distinguished members of the State Department's Board of Consultants, we would have to be very sure that all other participants had reached with us a common understanding as to how the agreement was to be applied—an agreement upon principles of law and of procedure.

In this respect, our current experience with the Russians, in respect of the United Nations Charter and such agreements as those of Yalta and Potsdam, is not encouraging. There will be a tendency to say that we cannot possibly consider the creation of an Atomic Development Authority with such wide powers as is now proposed, simply because we have no basis for common understanding with the Russians as to how to make it work. There will be a tendency to point out that our troubles with the Russians have rarely been in the matter of reaching agreements, but almost always when it comes to carrying out agreements in the terms which we thought had been agreed to but which the Russians interpreted in a different way.

Yet if we and the Russians both accept the necessity for international control of atomic energy, as the only alternative to a disaster which would be visited on them as well as on us, the Russians cannot fail to perceive the parallel necessity for finding a workable means of exercising such control.

If they accept the present plan as a basis for discussion—which is all it claims to be—then they cannot help seeing that something more will be needed to make it work than a scrawled signature and a pretty seal at the foot of a neatly printed document.

The very necessity which will be imposed upon the Russian leaders of thinking through the implications of the proposal will bring home to them the fact that they can never hope to establish workable collaboration with the western world altogether on their own terms. There will be much in this proposal that they will not like, that will even seem to them abhorrent. Yet they too must read what is proposed in the cold and awful light of the alternative.

It would be even more abhorrent to the Russians to have the United States, Great Britain and Canada continue, as they are now, the sole proprietors of atomic power and atomic weapons. In fact, from the Russian point of view we may assume this to be unthinkable.

The alternative, then, is for the Russians to do the best they can to catch up, to overtake and surpass the western powers in these field of endeavor. This means, to put it bluntly, an atomic armaments race. It can have only one end. Do the Russians really think this is their best bet? One must doubt it, for they cannot desire the inevitable outcome of such a process. The only remaining and acceptable possibility is some sort of international control.

It will, in any case, be a long time, perhaps several years, before the proposed Atomic Development Authority could be ready to begin its labors. If the Russians accept this plan, or any workable and acceptable plan for international atomic control, they must begin to think in terms of making it work and of convincing others that they can be reliable participants in making it work.

Thus the very consideration of the present atomic proposal may bring about the beginning of the means to carry it into execution. Far from rejecting it out of hand because the basis for interpreting and applying it does not exist, we should rather consider it as a documentation of an international necessity so urgent upon all peoples that its very expression in words must inspire all thinking men to seek for and to provide ways in which it can be converted into reality.

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UN Atomic Commission Almost Complete

The twelve-member United Nations Atomic Energy Commission has not yet met because several member nations have delayed the designation of their representatives. With the announcement, on April 30, of the appointment of A. Gromyko as representative of USSR, the Commission, which is made up of the nations which are members of the Security Council plus Canada, is almost complete, although the representatives of Mexico and Brazil remain to be announced.

The announced appointments are: United States, Bernard M. Baruch; United Kingdom, Sir Alexander Cadogan, with Professor James Chadwick, alternate; USSR, Andrej Gromyko; France, Alexandre Parodi, with Frederic Joliot Curie, alternate; the Netherlands, Dr. Eelco N. van Kleffens; Canada, Gen. A. G. L. McNaughton; Australia, Lieut. Col. W. R. Hodgson; China, Dr. Quo Tai-chi; Egypt, Dr. Hafez Afifi Pasha; and Poland, Professor Stefan Piénkowski, with Andrej Soltan, alternate. One delegate (Piénkowski) and three alternates (Chadwick, Joliot, Soltan) are scientists; the others are diplomats and civilian or military public officials.

Applied Science Restricted In Germany

The Allied Control Council on April 28, approved a law providing for a rigid and continuing control of scientific research in Germany. The study of applied nuclear physics is one of nine subjects forbidden to all and any Germans.

Also prohibited is research in applied aerodynamics, rocket propulsion, jet propulsion, gas turbine engines, radar, underwater sounding devices, electric coding and decoding equipment, ship design and the remote control of aircraft.

The law encompasses all universities, colleges, technical high schools, Kaiser Wilhelm institutes and industrial-research establishments. In addition, the law requires that all research and technical personnel shall be registered with the zone commanders.

Physics and Politics

. . . . . Charles E. Merriam

In 1869 Walter Bagehot wrote an interesting volume entitled, "Physics and Politics." Today we look again at this topic, but in a new and blinding light. The atomic bomb is an index of dynamic and revolutionary changes, the end of which is not in sight, and which I do not have the temerity to forecast. We are confronted by a revolution dimming in meaning all human revolutions rolled into one.

The meaning of atomic energies is often wholly misunderstood. The real marvel is not that these vast forces exist, but that they are found and harnessed by the human mind. The mind is king, not the atom. We trapped the atom; we have mastered some secrets of its latent forces, not by accident, but by deliberate design, by organization and ingenuity. We may marvel at the display of physical force, but the deeper force of mind made this triumph possible, and will bring still greater triumphs as we move along through eras of discovery and invention. The atomic bomb is a symbol of death and destruction; but it may also be a symbol of life, of construction, of a germinal principle which will create new conditions for mankind with science and organization as the guides to human goals of happiness and freedom long dimly seen. To say that Modern Man is obsolete is an interesting literary phrase, but the precise opposite is true. Modern Man comes of age.

It is, of course, possible that the atomic energies now unleashed in the form of the atomic bomb may prove to be uncontrollable under modern conditions, and that we may have come to the end of what H. G. Wells has called a "cosmic episode," relegating the world and all that dwell therein to dissolution and reintegration in the whirling universe of which we are a part. This I cannot disprove, but I prefer to take the other hypothesis that man can and will control the forces he has set in motion through the exercise of reason and science.

WORLD GOVERNMENT AND THE RIGHTS OF MAN

In this new era, there is little prospect of survival unless we can eliminate violence as a means of settling disagreements, and establish peace through a jural order of the world. This is a task to which the students of government may make a large and significant contribution, provided they "have what it takes to be ancestors."

Long before the atomic bomb fell, it was clear that the emerging characteristics of political association were not primarily territorial or ethnic. They are cultural, fraternal and human. The indications drawn from historical trends, from careful analysis, from reflection and religion alike point to larger areas of authority circling the globe, to kinship expanding beyond race to the brotherhood of man. Machiavelli discussed the relation of fear and love as directions of behavior. In this case, they join forces.

But in what directions and in what manner shall we advance? I begin not with structure, but first ask, "What is it that men have in common in this World Community?" We build around and upon what the World has in common. This calls for a new analysis and declaration of the common rights of man. Included here are the civil rights and political liberties long recognized in theory. We add in modern times, freedom of communication of words and images throughout the world. We add freedom of scientific research, and the dissemination of the results of inquiry. Men were not long successful in blocking Galileo or Darwin. We cannot exclude at this point the greatest of scientific discoveries in our age.

But there may be vast production of goods and services without a large share of justice and freedom in the society. It is consequently one of the problems of politics to examine the conditions and satisfactions of wants and their relation to freedom and justice. Otherwise the world may become a whirling mechanism of fantastic power and speed, directed toward other than general and public ends—a world peopled chiefly by robots who produce incredible results for ends they neither understand nor approve. And the cry may once again arise, was it for this mankind came into the world?

Our common civil and political rights in the technical and constitutional sense alone will leave liberty a mockery, unless they are reenforced by the framework of conditions in which rights may take root and grow and flower. We have in common the need for freedom from fear and want, for guarantees of employment, education, health, housing, recreation and cultural advantages. In broadest form, this means a fair share in the growing gains of civilization. Economic structure, class structure, racial structures, national structures may give the lie to words piously uttered, unless the dignity of man is translated into freedom and equality. This, too, is a challenge to the constructive ability of the technicians of government in times to come, when old energies long latent have been newly released and applied to man's needs; in a sense, the challenge of challenges. Doubtless the U.N.—the Economic and Social Council, the Commission on Human Rights—will meet this problem in the near future. Let us hope that they rise to the height of this great occasion in framing a flaming declaration of the rights of man.

At the threshold of the atomic era we encounter new and very difficult problems. Far greater concentrations of power than ever before known are on the way, in fact at the door.

How shall the consent of the governed, the basic principle of democracy, be organized and operated under these conditions? Even the time-honored principle of subordination of the military to the civil power is already threatened, even in the home of democracy.

I raise my voice to warn that unless the greatest care is taken and the soundest judgment dominant, human liberty may be lost at the close of a war for freedom; — lost in the toils of concentrated dictatorship such as has never been seen before.

Already we find that the regime of fear may stand in the way of full use of atomic energies, for alleged reasons of military necessity and security. Even now the full realization of scientific possibilities for human welfare is threatened — from the fear that military secrets may be used for industrial purposes, because they are so closely intertwined. This might be called an unconditional surrender to fear.

Many types of structural association are needed to compose the demand for a jural order of the world. Of course, we require a world court for the consideration and decision of justiciable questions and for arbitration and like forms of friendly offices.

We need a world council for such common purposes as may be agreed upon in the interest of the common good, looking to the ends of security, order, justice, welfare and freedom; the protection and development of basic common human rights. I am not discussing here the composition, organization, power and procedures of such a body. Of paramount importance is the setting up of an assembly looking at the recognized common good with a view to utilizing the common wisdom, the common will and common sense of participation in policy. I assume that we will build on the foundation of the U.N. eventually.

SELF GOVERNMENT

World government is not the death of self government, but its new birth and

From an address given before the American Political Science Association on March 29.

life. When the necessity for military self defense in the physical sense has disappeared, many associations will be in a position to flower and flourish as never before — labor, agriculture, industry, educational, scientific, cultural groups, may all proliferate as never before. What shall be their respective spheres of autonomy, of self-government in the best sense of the term? Here is an opportunity for the richest development of cultural autonomy the world has ever seen.

Unquestionably many new forms of affiliations, adherences and adumbrations will spring up around the Economic and Social Council, and especially about the new UNESCO. All sorts of supporting associations and even individuals will gather around the UN, puzzling the astute diplomats and the subtle jurists, but finding a solid basis of community of interests. There may well develop new forms of citizenship with new content and implications in a new period.

The place of the national state, now the most powerful association in the world, will be subject to constant reconsideration and to readjustment with varying views and insitutions of world order. How shall world authority be adjusted to the symbolism and the sovereignty of national authorities? The historic precedents of federalism and of direct jurisdiction of the central authority without regard to intervening authorities will doubtless be — in fact have already been —raised; but these older analogies may not be found sufficiently elastic or inventive to meet the new demands of the new and far more complex social forces and institutions.

PEACE-TIME DEVELOPMENT

A basic common need in a world community is that of systematic energetic planning for the expansion of income and the development of resources, human and natural, everywhere — planning that will release productive energies, enlarge production and bring rising living standards for all men everywhere. Those who scoffed at planning, safe in their own well cushioned security, will be forgotten except as examples of prescientific doubt and drift.

One of the implications of atomic energies is that we must be prepared to reckon with fundamental changes in the basic factors of our social-industrial system. We do not yet know how rapidly it will be possible to harness the new found energies to our system of production, distribution and consumption. Many estimators, I must say, seem as timid as the atomic bombers were bold. Some seem even frightened about proceeding with nuclear energies and would fold their hands awhile. But we are on notice that within the not too distant future, revolutionary changes will be made in this area. We will be obliged to consider not alone the organization of work, but also the organization of leisure time — the problem of recreational and cultural developments for millions of workers. Once the basic essential of a job, of food, of shelter, of education, of medicine are satisfied, what new type of social pattern emerges? Production, employment, stabilization, enterprise, profit, incentives, the balances between goods, services and leisure must be reconsidered in the light of new forces unleashed and attached to new machines. The proletariat tends to disappear, or if you choose to put it that way, the proletariat is all inclusive, and no longer a mark of differentiation.

Even before the atomic age this movement was well under way. The bomb, I reiterate, is only a symbol of vast changes going on in the rise and application of human intelligence to the world around us. The social pressures and controls involved in hunger, disease, poverty, want, were already on their way out, but the process has been accelerated many fold not only in physics, but also in chemistry, in biology, in medicine.

The last war cost hundreds of billions —difficult to calculate, since the effort and sacrifice transcend money values. How much could we afford to spend for peace-time uses of atomic energies? There is grave danger that we may find ourselves as ill-prepared for peace as we were for war; that the flood of new goods and services will overwhelm us with its variety and force. We must be prepared not only for military demobilization, but for the rapid reconversion of old time agencies, traditions, institutions, to the newer forms and functions required by the new times.

It cannot be too strongly stated that the driving motive need not be the fear of death, but the hope of life—richer and finer life than mankind has ever known —life more abundant. Even before the novelty of the roar and surge of the new power has died down, we can then prepare for the utilization of the fantastic wealth of forces available for the satisfactions of the wants of man.

SKILLS

What are the implications of the atomic age for the skills and organs of government?—the adjudicative, the conciliar, the administrative and managerial? With or without world government, these must be carefully sifted through in the approaching time. How will the ends of government, justice, order, welfare, freedom be realized through these agencies as time goes on—full speed ahead?

I do not know the institutional answers to these problems; nor can I predict what a book on government will look like say 20 years from now. But I do know that many of the institutions of our day must go into the crucible—to come out in what form I cannot know.

What will be their performance in a world of new energies and new releases of human activities? We know that courts function best in static periods; we know that legislative bodies struggle hard to deduce policies without being either arbitrary and petty on the one hand, or the rubber-stamp of experts on the other. Management, if it can escape the occupational disease known as bureaucracy, has less difficulty in close relationships with technicians and scientists.

In any case there is certain to emerge a vast body of research, organized in one form or another—research foundations, scientific councils or otherwise, public, private and mixed. Some have suggested science as a fourth branch of government. This is improbable and undesirable, but it appears beyond doubt that research will develop on a scale hitherto unknown, and that the results of research will point more and more precisely to lines of action. Undoubtedly the new National Research Foundation will make an important contribution to the growth of science in all its main aspects, physical and social alike.

How can we tap the intelligence, the will, the psychic energies of men to meet the new demands of leaders and mass alike—for one cannot function without the other. More than ever before the catalytic agency of politics will be essential for the full functioning of social forces in the framework of society. If we remain complacent, we may find ourselves as much out of the picture as those who were dazed and stunned by bombs.

Politics of the atomic age must raise its sights and expand its skills and techniques to meet the new situations as they sweep down upon us. This is a challenge to the flexibility, the resourcefulness, the creative quality, the inventiveness of politics.

The politics of the swords cannot solve the new problems; nor the backroom politics of the spoils system in its many forms; nor the politics of arrogance dressed in a little brief authority. The new day is a challenge to the politics of intelligence; to reason and science; to generative and regenerative abilities; to faith in the future; to vision; indomitable resolution; unconquerable persistence.

It is at this point that physics and politics meet, and meeting need never part, marching along together toward their common goal. This is one world, and one universe as well. I know we need them and I am convinced that they need us, and will welcome a hand.

The world is not likely to become, however, a vast hospital with the doctors assuming control alongside friendly nurses or other administrative assistants,

with a passion for anonymity shall we say? Or a camp, a factory or a laboratory.

ENDS OF GOVERNMENT

We know that the ends of government are security, order, justice, welfare, freedom. What effect will the new order have upon these goals of the political? If we assume, as I do, that the atomic bomb will outlaw war, not alone on paper, but in living fact, the end of military security as a political problem will tend to decline and even disappear. If there are no armed enemies, the elaborate apparatus designed for the military state has no significance and tends to drop away.

The violent functions of government would tend to shrivel away, both on the world scene and locally, although not to disappear. It would then be necessary to rethink the ends of government in the light of the new situation, and endeavor to outline the remaining functions of the poitical—and perhaps the order of their priorities—still a matter for political sophistication and action.

In the atomic age it would appear that welfare, using the term to designate in a broader fashion, the production of a great body of human utilities and services, would certainly loom large as one of the objectives of government as well indeed as of all society.

Production of goods and services when once placed upon a higher level of insight and intelligence and when freed from the suspicion of exploitation which has so long dogged the footsteps of production, will make possible far-reaching advances toward the attainment of human potentialities. Government need not be the one competent producer, but will certainly concern itself with the apparatus and conditions of production and with the general and just diffusion of products throughout the community. Liberty and justice will loom larger than before.

ROLE OF POLITICS

It may be hastily concluded that the role of politics in the atomic age will be larger than ever before. This does not follow, however. In the short run there may be many expansions of governmental activity in many different directions. But in the long run this may not be true, and indeed it is not impossible that government as such may play a more modest part than now. We need not forget that government has few friends. The communists have always talked about the withering away of the state; the rugged individualists look upon government as a necessary evil at best; the church has always looked down upon the state as the work of the devil primarily; science regards government as ignorant and perhaps obstructive. At the very moment when the state seems to be in full command, its vaunted powers may shrivel and fade, unless it can rise to the heights of the new configurations demanded by the new times.

Undoubtedly many new forms of reciprocal adjustments will be set up in the new environment before us, in the establishment of world order, of industrial equilibrium, of basic standards of existence, of human rights, of adequate accountability for new elements of power in the community. Communism and capitalism, Marx and Mill, do not exhaust the vocabulary or the theoretical and practical possibilities of science, political, economic or otherwise, natural or unnatural. The whole purpose of strategic controls and either socialization or decentralization should be the higher form of coordination; the emancipation and release of human energies for fuller freedom.

Politics may thus be said to have a double task in the new age. On the one hand of expanding its functions to bring about basic enterprise, equilibrium and accountability; and on the other hand of demobilizing its own control as rapidly as possible, once the primary objective has been reached, as soldiers are at one time freely expendable and at another rapidly deployable.

To those of the older generation who may think all this is chimerical, I may say that the younger generation understands more quickly the meaning of physical problems than their elders, and may be found to fit with surprising readiness into the needs of the new day for insight, speed and execution. I often find conversation with atomic scientists very refreshing. They may not have experience in politics, but they have courage, vision, and are not frightened by bugaboos.

We need more intimate cooperation with the atomic scientists who are looking for more light in political relations. Our needs are mutual and there are great possibilities in joint action. Many of the atomic scientists have "got religion" so to speak—a sense of social responsibility for what they do; and if they get politics likewise, the world is on its way; or if we meet half-way the technicians in government, the result may prove to be not only exciting, but enlightening.

I suggest the organization of an American Committee on Atomic Energy.

Such a committee might come together for the purpose of considering the broad underlying problems raised by the new developments in atomic energy and its practical applications to human affairs, and for taking such action as seems appropriate from time to time.

Such a Committee might include scientists and technicians from such organizations as the National Research Council, the AAAS., the Social Science Research Council, the Atomic Scientists, and perhaps others.

We need wider spread to all men everywhere of what is now known to political technicians, and this through the multifarious agencies of communication and education now available.

We need the recruitment of far larger personnel and far greater resources for the pursuit of new political truth and its practical applications. Our present facilities are pitifully inadequate to cope with the gigantic task that lies before us. The pages of the Political Science Directory are very thin when compared with the long lists of trained chemists and physicists—far thinner when the list of those who devote the major part of their time to new truth is reckoned.

Finally, if all this seems too professional in character, I submit a few proposals or projects for systematic study in an era of the closer union of physics and politics:

I. A new look at human freedom:

An analysis of the ways and means of preserving freedom and the consent of the governed in the atomic age.

II. Deliberate and systematic planning through as serious an effort as in war, to apply atomic and related energies to peacetime purposes—to increase the gains of civilization, while guaranteeing a fair share of these gains to all men everywhere.

III. Analysis of the organization of a World Community and a World Government, and mapping the roads, theoretical and practical, leading thereto.

I do not have the time or the strength to enter, explore and build up the new and promised land of physics and politics. Evolution points a peaceful way to the new environment we might enter and develop, but the movement will be revolutionary in thought, if not in deed.

League of Women Voters Puts Atomic Energy First

The question of the control of atomic energy took precedence over all other considerations at the 17th convention of the League of Women Voters of the United States, held on May 2 at Kansas City. The delegates, voting on an agenda for league study and support, stressed "public control of atomic energy under civilian agency to insure full development in the public interest and full conformity with international agreement."

The wives of three of the atomic physicists who worked on the Manhattan project—Mrs. Allen C. G. Mitchell, Bloomington, Ind., Mrs. Henry De Wolf Smyth, Princeton, N. J., and Mrs. T. R. Hogness, Chicago, attended the convention as delegates or national board members.

The atomic control item was part of the "active list" agenda adopted by the convention. The "active list" is a program defining the areas for special consideration during the next two years.

International Bureau of Nuclear Standards . . .

. . . . . G. Sacher

The authors of the State Department's **Report on the International Control of Atomic Energy** emphasize that the early disclosure of information is essential for the establishment of international controls. The report further states (page 56) that "Without much delay (the Atomic Development Authority) should set up laboratories for the study of nuclear physics and the technological problems that it must expect to encounter in its future work."

In the **Draft for a Convention on the Control of Atomic Energy** (Bulletin v. 1 No. 8) by Professor Quincy Wright, provision is made (Art. V, par. 26) for the formation of a Bureau of Nuclear Studies to be created as early as possible.

These authorities evidently consider the formation of an international laboratory to be an important step in achieving effective international control. The following (written before the issuance of the State Department Report) is an attempt to spell out some of the activities of such a laboratory, and the importance of these activities for the success of international controls of nuclear energy. We will refer to the laboratory as the International Bureau of Nuclear Standards.

The essential duties of this Bureau would be the following:

1. Establishment and continual revision of definitions, nomenclature, and symbolism for the constants of the nuclear sciences, with especial attention to the avoidance of ambiguities in translation.
2. Promulgation of standard values of the constants of the nuclear sciences based on measurements made within the Bureau by the best accepted procedures.
3. Setting of standards of purity and strength for materials employed in nuclear energy installations which enter into international trade.
4. (a) Sampling and testing of all materials entering into the construction of specific plants, and (b) official measurements of samples of fissionable materials or other materials collected in the course of inspection.
5. Publication, in official bulletins, of the best practices in design and operation of nuclear energy installations, with especial attention to (a) maximum accessibility for inspection, (b) minimum ease of conversion to bomb plants, (c) maximum efficiency as power units and (d) safety.
6. Evaluation of designs submitted with application for license, and recommendations to a licensing board, with respect to criteria mentioned in (5).

Sufficient justification for all the above functions of an International Bureau of Standards, and for others not stated here, may be found in the historical fact that in every area of scientific and commercial interchange, such regulatory functions have been found necessary. Where the interchange is international, international agreements are ultimately made, as in the case of the physical units. The same necessity is found for agreements on operational practices in such world-wide industries as aviation and the merchant marine.

Still more important is the necessity for unequivocal agreements and standards as the basis for inspection procedures. Without these, the attempt to enforce international control could degenerate into a babel of accusations and denials. Let us suppose that a critical stage in control procedure is that of predicting the output of plutonium to be expected from power piles, and comparing this with the actual amounts declared by the operating agency. Any deficit of the declared from the predicted amount would have to be accounted for by the operators, and an unsatisfactory explanation would be tantamount to a violation of the control agreements. In these circumstances, the inspection authority would need to be in a very strong position, since otherwise the suspected nation could dispute the charge by saying that the discrepancy was due to pecularities of design, materials, or operation not taken into account in the estimates by the inspection authority. The inspection authority could not be its own arbiter in these matters, but would have to rely on an independent bureau of standards with world-wide prestige and authority. This bureau would have made complete determinations of all the data necessary for the estimation of performance, perhaps under circumstances which would preclude any knowledge of the ownership or ultimate use of the materials tested. Thus one large area of dispute could be removed.

The burden of responsibility for effective control procedures will rest entirely on the international control authority. A nation which could evade some phase of control by means of superior knowledge might well consider itself justified in doing so, and presumably could not be brought to task for evasion as long as it conformed to the letter of the control regulations. Therefore, the international control authority would have to keep itself abreast of the latest developments in nuclear physics and technology. Since the strength of the Bureau of Standards is in its scientific personnel, there must be incentives to accept appointments; including the provision of large research installations under direct jurisdiction of the Atomic Energy Commission and the grant of broad powers to the Bureau so that each nation would be interested in being represented by its best men.

So far we have considered the long-range necessity for the Bureau; but there is a very pressing immediate problem. An international scientific bureau should be one of the first bureaus to be put into operation by the UNO Atomic Energy Commission. Its first duty should be to collect, by independent research if necessary, the information needed by the other bureaus working to set up controls. The alternative is that in the formative stages each nation will be represented by commissioners, with scientific advisers who can talk to their own commissioners, but not to the scientists from other nations.

An international scientific body can, by collecting information and doing research independently, minimize the harm caused by nations which consider their scientific knowledge to be private property. Whether this investigatory function should be carried out by the permanent Bureau of Standards or by a temporary organization set up for the purpose is a matter which should receive further consideration.

Use of Atom Bomb Assailed By Sheen

Msgr. Fulton J. Sheen of Catholic University in a sermon on April 7 in St. Patrick's Cathedral in New York scored our use of the bomb on Hiroshima as an act contrary to the moral law and said, "We have invited retailiation for that particular form of violence."

Both obliteration bombing and use of the atomic bomb are immoral, Msgr. Sheen said, because "they do away with the moral distinction that must be made in every war—a distinction between civilians and the military."

After quoting the Pope's warning against destructive use of atomic energy in an address made at the opening session of the Pontifical Academy of Science on Feb. 21, 1943, Msgr. Sheen said: "It is to be noted that the Holy Father not only knew about atomic energy and something of its power, but he also, exercising his office as Chief Shepherd of the Church, asked the nations of the world never to use it destructively. This counsel was not taken. This moral voice was unheeded."

Discussing arguments that use of the atomic bomb shortened the war and saved the lives of American fighting men, Msgr. Sheen declared: "That was precisely the argument Hitler used in bombing Holland."

Atomic Energy in the House of Commons. . *Edward A. Shils*

Recent debates in the House of Commons have revealed interesting attitudes on the part of Members of Parliament and of the Government and disclosed some aspects of British Government activities in the atomic energy field.

Despite the numerous statements by British governmental and parliamentary leaders on the urgent necessity of the international control of atomic energy, in the first few months after Hiroshima, recent discussion in the House of Commons has touched only infrequently on the international aspect of atomic energy. When Mr. Blackburn, Labour M.P. for Birmingham, Kings Norton, who has become the keeper of the House of Commons' conscience in atomic energy matters, asked the Prime Minister on April 8th, whether he had any statement to make on the Acheson Report, Mr. Attlee said he preferred to make no comment on the subject, prior to the discussions in the United Nations Atomic Energy Commission, but that the Report would be published by His Majesty's Stationery Office, even though it was not an expression of the views of the American Government.

BRITISH RESEARCH PLANS

Domestic and economic aspects has engaged the attention of the House of Commons to a far greater degree. The coal crisis in Great Britain, which is now at its height, has impressed a number of Members of Parliament with the urgency of the development of atomic energy for peaceful uses. Lt. Col. Martin Lindsay, Conservatice M. P. for Solihull, on March 28th, basing his argument on the expectation that British coal supplies will be exhausted within 50 years, demanded both that the Government explain more fully what it is doing in the atomic energy field and that it do more than it has hitherto done. He was supported in these views by Mr. Blackburn. Mr. Blackburn criticized the government for the inadequacy of its expenditures on atomic energy research which was projected by Prime Minister Attlee to be £ 2,800,000, in contrast to which Mr. Blackburn asserted that an initial appropriation of £ 30,000,000 was necessary to conduct research on an adequate scale. In response to these criticisms, both the Prime Minister and the Minister of Supply, Mr. Wilmot, have declared that the atomic energy research program in Great Britain is limited not by financial considerations but by the numbers of trained scientists and material resources available, especially in building and equipment. Mr. Wilmot said; "Whatever we can do, we shall do...We are losing no time and sparing no effort. We are employing the best brains and preparing to devote as large a sector of the national effort as can be spared to this development, which we regard as of transcending importance...In the new bill presented by the Government on May 2nd, a sum of £ 30,000,000 is presented as a preliminary estimate of the cost of research and production. The Supply Minister described the progress of the Harwell Research Station as follows: "The central planning is in the hands of the Prime Minister and the cabinet, advised by the learned Advisory Committee presided over with great distinction by the right hon. Gentleman, the Member for the Scottish Universities (Sir J. Anderson)...The research establishment which it is proposed to establish at Harwell will be got going a soon as it is physically possible. It will be provided with every possible facility. The airfield was evacuated by the Royal Air Force at the beginning of the year, and work of converting the buildings to their new purposes is already under way. New, highly specialized, buildings will need to be constructed, and a team of experts is at present in Canada preparing plans to incorporate the very latest knowledge ... At the same time we shall press on with the construction plant to produce the fissionable material which the research establishment will require ... The first stage of the work of extensive designing and planning of operations is going forward. A special organization is being established for the purpose. Work is starting. Accommodation for the designing team has been made available at a Ministry of Supply factory at Risley, near Warrington. Engineering and other expert staff is being recruited as quickly as it can be obtained. The examination of sites for the establishment of the main production plant is now going forward, but no decision has yet been made. Meanwhile, the Ministry of Supply factory at Springfields, near Preston, has been selected as the site for the subsidiary plant for the processing of materials. Over and above these direct Government research and production activities, it is the Government's policy to encourage and support, in every way, research at universities and elsewhere on fundamental problems which may, in time, lead to discoveries of prime importance in this new field of nuclear energy."

BRITISH ATOMIC ENERGY BILL

After having been pressed on several occasions to state whether an atomic energy bill, similar to the U. S. McMahon Bill for the control and development of atomic energy, would be introduced into the House of Commons, the Government on May 2nd, announced a bill to place atomic energy research and production under Government control. The Ministry of Supply will have the power to acquire materials plants and contractual rights relating to atomic energy. Operating under civilian control, the Atomic Energy Section of the Ministry of Supply will have powers to inspect any building where there is reason to believe atomic energy research or production are being conducted. First press reports of the bill did not indicate whether inspection would be carried out by existing security agencies or whether the atomic energy office would establish its own. Security provisions apparently prohibit the disclosure of production techniques but will not apply to scientific knowledge.

The Minister of Supply insisted that the bill would be compatible with Britain's full collaboration in an international control scheme. The question as to whether atomic bombs would be produced was left open.

Members of Parliament have also raised questions regarding the seriousness and comprehensiveness of the government's plans for domestic utilization of atomic energy in view of the decision of the Central Electricity Board to spend £300,000,000 during the next ten years on the supply of electricity and in connection with the new plans of the Board of Trade and the Ministry of Town and Country Planning for the location of industry and the planning of urban settlements. Thus far, the Government has made no reply to these criticisms.

Many questions have been raised about atomic energy control throughout the Empire, since some of the Members believe that atomic energy will be of even greater importance for certain parts of the Commonwealth, like India and Australia, where present fuel sources are insufficient. In response to one of these questions it was disclosed that a continuous survey of the resources of the British Commonwealth and Empire of uranium and thorium has been in operation for an unspecified time.

THORIUM AND URANIUM SUPPLIES

The control of uranium and thorium sources has been repeatedly discussed in the course of which the Government has announced that "steps have already been taken by his Majesty's Government and other Commonwealth and Empire Governments to ensure full control over the disposal of such supplies". It should be noted that Mr. Attlee spoke of control over the disposal of uranium and thorium and not actual acquisition for which Mr. Blackburn has been pressing.

A gap in the Government's program of control over uranium and thorium de-

(Continued on page fifteen)

Chairman of American Chemical Society Calls for International Cooperation of Scientists

Chairman-elect of the ACS, Prof. W. A. Noyes of the University of Rochester, appealed on April 8 at the Atlantic City meeting of the ACS, for free speech for, and international cooperation between scientists:

"Throughout the ages science and politics have never been completely separated.

The first World War saw the scientist raised to a position of importance in national defense which he had never attained before, and the recent world conflict has taken him into politics whether he likes it or not.

But along with the exaltation of the scientist to the role of the person who must be pampered and favored so that he will do his bit for his country, be it right or wrong, there has come the desire to control him and to make him the tool of those forces to which he should show the most aversion.

An inevitable conflict is now bound to arise, and scientists must give careful thought and consideration to their future, or they will find that the very achievements which have brought them to a position of eminence will be the main cause of their downfall. Americans have always believed in free speech and assembly. Are scientists to be subjected to something which is not American and which will, if carried to its logical conclusion, make the practice of science, in the true sense of the word, impossible?

The Army and the Navy both should be expected to perform functions which devolve on the armed services, but military men are not trained as scientists. The only guarantee of progress in science and of peace in the world is an avoidance of laws, applicable to peacetime, which restrict the scientist in discussions with his fellow scientists. He must have the full benefit of the work of others if his talents are to be used to the fullest advantage.

But platitudes of this sort mean little unless they are followed by recommendations for a definite course of action. Can we as Americans afford to give the world the benefits of our scientific endeavor unless we receive similar benefits in return? Probably not yet, but let us follow a course of action which will make reciprocity easy if not inevitable.

The Russians called an international group of scientists together last June even before the end of the war with Japan. Let us call international scientific congresses to be held in this country at an early date. Let us bring in the scientists of all countries, small and select groups at first, perhaps, but in any case let us pay expenses if no other means can be found. Above all let any of our own scientists attend regardless of whether they worked on atomic bombs or other top secret projects. Let us show that we trust our scientists and let the world know that we believe progress and happiness depend on a free interchange of information and ideas. Scientists do have a common language and they can sit around the table in amicable discussion. Perhaps their example could alleviate some of the distrust so prevalent today."

Kansas Meetings . . . . . *by Lyle Borst*

A group of six atomic scientists, cooperating with a group of faculty members representing the University of Kansas, has made a systematic tour of Kansas during the first part of April, as an experiment in public education.* The experiment was an unqualified success.

The State of Kansas was divided into regions surrounding eight key cities: Kansas City, Topeka, Salina, Hays, Dodge City, Wichita, Chanute, and Pittsburg. In each city a group of about 200 representatives of local and regional organizations met to discuss the problems before the United States and the world, made urgent by the advent of the atomic bomb.

Each conference opened with a morning session devoted to the realities of atomic energy. A panel of four atomic scientists discused the fundamental facts and their consequences; that we may expect no enduring monopoly of the atomic bomb, that there is no defense, that other nations can do what we have done in 3 to 5 years, and that the control of the bomb must be accomplished on a world level.

The afternoon session began with the showing of films of the Alamogordo test and the Nagasaki strike. A description was given by Dr. Jorgensen of Los Alamos, of his impression of an atomic explosion. The panel at this meeting consisted of University of Kansas faculty members and scientists. Possible peacetime application and the economic implications of atomic energy were described. The remainder of the session was devoted to the problems of international and domestic control with great emphasis placed upon the Acheson Report as a realistic and feasible approach to their solution.

The evening dinner session was led by a panel of local people and was devoted to a floor discussion of what the people in that community could do. At about half the conferences resolutions were passed with great unanimity, endorsing the principle of international control as embodied in the Acheson Report, and endorsing the principles of the original McMahon Bill. Where resolutions were not proposed, floor discussion showed the same unanimity of opinion expressed at other places by formal resolutions.

The popularity of these conferences was great. The response was enthusiastic, and the interest did not lag at any time. The final success of the series, however, cannot easily be determined, for it will rest upon how the representatives present carry the information back to their organizations and what action is taken by these organizations. The conferences received excellent coverage by the local papers, and in many cases half hour radio broadcasts were given by the visiting scientists.

The idea for the systematic coverage of Kansas came to Dr. Hilden Gibson, professor of Political Science and Sociology at the University of Kansas, after attending a conference on atomic energy at the University of Denver at which universities of western and mountain states were represented. Chancellor Walott of the University of Kansas, agreed that such a program fell within the established policies of the University of Kansas. The success of the venture must be attributed to the diligence of Dr. Gibson and the admirable ground work laid by Mr. Lee Gemmell of the Extension Division of the University.

The method of developing such a series is worthy of description. A request was sent from the Extension Division to the superintendent of schools at each city asking him to form a local committee to meet with Mr. Gemmell to lay plans. At each of these meetings the idea and purpose of the conference was explained. The local committee was requested to submit a list of names of leading citizens and representatives of local organizations to whom invitations would be sent. The local committees made arrangements for a place to hold the conference and other details.

The scientists present at various stages were: H. S. Brown, L. B. Borst, P. S. Henshaw from Oak Ridge, Tenn.; D. L. Hill, J. J. Nickson, from Chicago; Theodore Jorgensen from Los Alamos. Members of the University of Kansas faculty were: E. P. Allen, Director of Government Research, R. A. Brewster, Chair. Dept. of Chemistry, H. B. Chubb, Dept. of Political Science, Lee Gemmell, University Extension Division, Hilden Gibson, Dept. of Political Science and Sociology, R. S. Howey, Dept. of Economics, D. M. Hume, Dept. of Chemistry, (formerly of Oak Ridge, Tenn), John Ire, Department of Economics, J. A. Maloney, Director of Research Foundation, L. J. Pritchard, Dept. of Economics, W. E. Sandelins, Chairman, Dept. of Political Science, E. O. Steve, Dept. of Political Science, J. D. Stranathan, Chairman, Dept. of Physics, L. L. Waters, Dept. of Economics.

*A short report on this tour was given in Bulletin No. 9.

SCIENCE AND RESEARCH IN THE LIBERATED COUNTRIES

J. A. Simpson

In London, I met Dr. Holbrook MacNielle. He has been the liaison officer in London for the Office of Scientific Research and Development, which closed recently. Realizing that there is still a great service to be performed in scientific liaison with Britain and the liberated countries, Dr. MacNielle accepted a similar position with the Navy Bureau of Research and Invention.

He pointed out, as I later found out myself, that the scientists on the Continent of Europe lack the most elementary equipment and supplies. The British scientists are already helping as much as they can to correct this situation. Because of the present financial difficulties in England and liberated Europe the scientists are not allowed to purchase goods from the United States.

It is important to remember that UNESCO will formulate the long range program in this field and that scientists in all the countries will depend upon it quite heavily. In a discussion with Dr. Julian Huxley, I learned that quite an extensive program for the interchange of scientists and scientific information will be undertaken by UNESCO. He believes, for example, that such things as electronic calculating machines should be located in strategic parts of the civilized world for the use of scientific groups and that many branches of a microfilming center should be distributed throughout the world. The program, however, is one which will take several years to place in effective operation. At the present time, the Preparatory Commission for UNESCO (on which Mrs. Stephen Brunauer is the USA representative) is in no effective position to help scientists in the liberated countries.

There are a few possibilities for helping to stimulate science in the liberated countries immediately:

1. It might be possible to open an account in the United States for foreign scientists to use in ordering books and equipment. This procedure would permit individuals to receive the equipment or books that they need. Such a program would have to be sponsored by a foundation.

2. If scientific journals are still not being received by foreign countries, we might provide a fund for purchasing back issues and current issues of journals in America and arrange with some existing distribution system to distribute the journals to specified foreign universities and scientists.

3. United States scientific and technical liaison officers could be stationed in the European area and China. American scientists could make substantial contributions to our nation as well as to the other nations by spending a year in such areas. Dr. MacNielle pointed out that several U.S. scientists, through his office, should visit all European laboratories to determine the conditions for research which exist at present. The British Commonwealth Scientific Office in the U.S., China and elsewhere has proved invaluable for all nations concerned. The French Scientific Mission in London is equally valuable.

This is a continuation of Dr. Simpson's note on his trip to London. (See **Bulletin** Vol. 1, No. 8)

Atomic Energy in the House of Commons . Cont.

(Continued from page thirteen)

posits was exposed by Mr. Blackburn with respect to the ownership of the extensive thorium deposits in Travancore, India, which are the largest deposits of thorium in the world. Mr. Henderson, Under-Secretary of State for India, announced on March 18th, that the deposits "are the property of the State of Travancore. Adequate steps to control their disposal have been taken by the State Authorities in consultation with the Crown Representatives". Mr. Henderson did not reply to a question as to whether the Government should not have acquired the deposits previously, nor did he seem to show awareness of a fact disclosed on the 28th of March by Mr. Blackburn, that the Travancore deposits are being worked on a concession held by a company, apparently British, called Hopkin and Williams (Travancore) Limited, in which a substantial interest is held by Imperial Chemical Industries which should of course facilitate the Government's control over these deposits.

AMERICAN SECRETIVENESS

Critics, impatient with the Government's policy, have discharged some of their resentment against the United States, saying that part of the reason for the backwardness of Britain's atomic energy development at present is due to the ungenerous secretiveness of the American Government which has refused to divulge information regarding the production of plutonium or the details of the construction of the type of atomic bomb used against Hiroshima.

On March 28th, Mr. Blackburn said: "British scientists know all the details made of uranium 235. We do not know—and it has been made clear by the Prime Minister's answer to a previous question—of the construction of the atomic bomb the details of the construction of an atomic bomb made from plutonium. The Nagasaki bomb was made from plutonium, and was, in fact, about four times as powerful as the uranium 235 bomb which was dropped on Hiroshima. The seriousness of that is this. Of the peaceful development of atomic energy 90 per cent is associated with the plutonium process and only 10 per cent with the separation of uranium 235. British scientists know perfectly well how to construct a bomb made out of uranium 235. Therefore, it is not logical for the United States of America, on the grounds of military security, to refrain from divulging to us information about the plutonium process, because we know how to make a bomb made of uranium 235 ... Therefore, it seems to me to be a most serious matter that the United States of America should be failing to allow our scientists to visit, for instance, Hanford Engineering Works, where plutonium is manufactured, which produced the bomb. As an illustration of how important the plutonium process is as compared with the uranium 235 process, it is from the plutonium process that one is able to extract, in bulk, the radioactive substances and radiations which are of such vital value in medical research and therapy. This is, in some respects, most ungenerous, when one considers that Britain was responsible for almost all the fundamental research on this subject. Our British scientists went over to the United States of America; our British scientists contributed every scrap of knowledge they had on this subject."

* * *

In general, the Government, speaking through Mr. Wilmot, although conceding the claims made for atomic energy's ultimate significance for British economic life, has in its general tone, seemed, at least prior to the introduction of the bill on May 2nd, to deny the validity of these claims. Mr. Wilmot, in his statement of the 28th of March repeatedly asserted that the obstacles in the development of atomic energy for peaceful purposes are still very great and will remain so in the near future, that fuel costs are only a small proportion of the total cost of energy, and that the need for coal will continue undefinitely into the future as far as Great Britain is concerned. A general atmosphere of conservatism and of grudging concessiveness to his critics, pervaded Mr. Wilmot's statement. It is therefore difficult to determine whether the apparent slowness of the Government's prosecution of the atomic energy program is due to the genuinely insuperable difficulties arising from manpower and materials shortages, or whether they are a product of unimaginativeness and unwillingness to entertain the possibility of drastically unconventional solutions of problems in an industry, the problems which socialists have traditionally thought could be solved simply through socialization.

In this issue:

Frederic Joliot—Nobel Prize Laureate in Physics; alternate delegate for France on the UN atomic energy commission.

Charles E. Merriam—Prof. Emeritus of Political Science at the University of Chicago; Past President of the Social Science Research Council and the American Political Science Association.

Profs. Robert E. Marshak, Eldred C. Nelson and **Leonard I. Schiff** are in the physics departments of the University of Rochester, California Institute of Technology and the University of Pennsylvania respectively. During the war, they were members of the staff of the Los Alamos Laboratory, New Mexico.

Lyle B. Borst is a leading nuclear physicist at the Clinton Laboratories, Oak Ridge, Tennessee, and a member of the Executive Committee of the Association of Oak Ridge Scientists.

George Sacher is Associate Biologist and Group Leader on the Metallurgical Project at the University of Chicago.

Edward A. Shils—Ass't Professor of Sociology, University of Chicago; Ass't Director of the Office of Inquiry into the Social and Political Implications of Atomic Energy.

Council of Federation of American Scientists Meets

The council of the Federation of American Scientists met at the University of Pittsburgh on April 20 and 21. Representatives of 15 organizations with a total paid-up membership of about 2000 scientists (a list of FAmS member organizations is given below) were present. Three new associations—Eastern Iowa, Wiscon sin and Cornell University—were admitted to the Federation.

Atomic Energy legislation, general science legislation and the State Department Report were discussed on the first day. Resolutions endorsing the Kilgore-Magnussen bill on National Science Foundation and the Acheson-Lilienthal report were adopted.

On the second day, reports were made on the educational activities of the individual organizations, including the several professional and city-wide conferences organized at Chicago and the state-wide lecture tour in the state of Kansas. It was decided that each group in the Federation should organize at least one conference within the next 6 weeks, or a state-wide undertaking within the next 3 months.

MEMBERS OF FEDERATION OF AMERICAN SCIENTISTS

as of April 9, 1946

Association of Cambridge Scientists, Radiation Laboratory, M.I.T., Cambridge 39, Mass.

Atomic Scientists of Chicago, 1126 East 59th Street, Chicago, Ill.

Association of Los Alamos Scientists, P.O. Box 1663, Santa Fe, New Mexico.

Association of New York Scientists, 3280 Broadway (until June 15, 1946), New York, N. Y.
also: Physics Department, Columbia University, New York 27, N. Y.

Association of Oak Ridge Scientists, P. O. Box 1251, Oak Ridge, Tenn.

Association of Pasadena Scientists, 1201 E. California St., Pasadena .Calif.

Rocket Research Group, Allegheny Ballistics Laboratory, P. O. Box 210, Cumberland, Md.

Oak Ridge Engineers & Scientists, 433 East Drive, Oak Ridge, Tenn.

Dayton Association of Atomic Scientists, 1503 No. Main Street, Dayton 5, Ohio.

Association of Pittsburgh Scientists, 402 Thaw Hall, University of Pittsburgh, Pittsburgh, Pa.

Association of University of Michigan Scientists, Department of Chemistry, University of Michigan, Ann Arbor, Michigan.

Federation of American Scientists, Rochester Association, Dept. of Botany, Rochester University, Rochester, N. Y.

Association of Philadelphia Scientists, Physics Dept., University of Pennsylvania, Philadelphia, Pa.

Northern California Association of Scientists, 2008 Channing Way, Berkeley 4, Calif.

Association of Eastern Iowa Scientists, 614 S. Clinton, Iowa City, Iowa.

Association of Scientists of Cornell University, Rockefeller Hall, Ithaca, N. Y.

Wisconsin Association of Scientists, Dept. of Physics University of Wiconsin, Madison 6, Wisconsin.

Report to War Dept. . . .

(Continued from page four)

of population and industry in comparatively few metropolitan districts, will be at a disadvantage compared to nations whose population and industry are scattered over large areas.

We believe that these considerations make the use of nuclear bombs for an early unannounced attack against Japan inadvisable. If the United States were to be the first to release this new means of indiscriminate destruction upon mankind, she would sacrifice public support throughout the world, precipitate the race for armaments, and prejudice the possibility of reaching an international agreement on the future control of such weapons.

Much more favorable conditions for the eventual achievement of such an agreement could be created if nuclear bombs were first revealed to the world by a demonstration in an appropriately selected uninhabited area.

In case chances for the establishment of an effective international control of nuclear weapons should have to be considered slight at the present time, then not only the use of these weapons against Japan, but even their early demonstration, may be contrary to the interests of this country. A postponement of such a demonstration will have in this case the advantage of delaying the beginning of the nuclear armaments race as long as possible.

If the government should decide in favor of an early demonstration of nuclear weapons, it will then have the possibility of taking into account the public opinion of this country and of the other nations before deciding whether these weapons should be used against Japan. In this way, other nations may assume a share of responsibility for such a fateful decision.

The Cornell Association of Scientists

The Association of Scientists of Cornell University at Ithaca, N.Y. is the most important recent addition to the Federation of American Scientists. The new organization counts among its members some of the prominent "atomic scientists" formerly associated with the Los Alamos atomic bomb laboratory—R. F. Bacher, H. A. Bethe, Phillip Morrison and Richard P. Feynman.

A series of radio programs over station WHCU and a panel discussion on station CRG on the subject of World Control of Atomic Energy have been organized.

Dr. J. R. Oppenheimer is presenting a series of six Messenger lectures at Cornell between April 30 and May 14 on the technical and political problems of atomic energy.

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